REMARKS

AMENDMENTS

Claims 1, 5, 6, 7, 8, 9, 10, 14, 18, 19, 20, 21, 26, 27, 29 have been amended to clarify that the type of sample being examined is a microelectronic sample, which would include for example a microelectronic component or assembly such as an integrated circuit (IC). Support for this amendment is present throughout the specification, including for example paragraphs [0061]-[0066]; [0103]-[0117], which discuss various embodiments of the invention used in connection with analysis of an integrated circuit.

RESPONSE TO CLAIM REJECTIONS UNDER 35 USC §102

Claims 1-4 were rejected under 35 U.S.C. § 102(b) as being anticipated by Hashimoto(JP11009604A). This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. The translated abstract of the Japanese reference relied on by the Examiner does not appear to disclose anything like the present invention and does not disclose, *inter alia*, acoustic microimaging of a microelectronic sample as recited in claims 1-4. As such, it cannot anticipate claims 1-4.

Hashimoto appears to be directed to macro-imaging of a tumor in a body part, and preventing a blood image "from being formed in front of a tumor image so that the orientation feeling is improved." The Examiner has not shown that Hashimoto is analogous art to the present invention or that one skilled in the art of acoustic microimaging would look to

Hashimoto, which does not address non-destructive testing and failure analysis of a microelectronic component or assembly, such as an integrated circuit. Hashimoto appears to be directed to medical imaging and locating and imaging tumors, not locating microscopic voids, cracks, disbonds, air bubbles or other impedance features in an integrated circuit.

There are significant technical reasons why Hashimoto would be inapplicable to acoustic micro-imaging. For one thing, the ultrasound frequencies that are used for acoustic micro imaging are significantly different than those used for macro-imaging of a body part. The present invention utilizes ultrasound frequencies in the range of about 10MHz to around 230 MHz or more. Ultrasound at these high frequencies typically requires a coupling medium such as water or an inert fluid. The high frequencies used in micro-imaging are not practical for macro imaging of an organ because for example the sound wave cannot penetrate the skin or organ sufficiently to provide a meaningful image. Medical imaging typically requires lower frequencies that can pass through skin and penetrate a body part or tumor.

The Examiner has asserted that claims 2-4 are inherently disclosed in Hashimoto. To establish inherency, the Examiner was required to establish that Hashimoto "make[s] clear that the missing descriptive matter is ***necessarily*** present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill in the art." *In re* Robertson, 169 F.3d 743, 745 (Fed. Cir. 1999) (citing *Continental Can Co. v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991) (emphasis added). "Inherency, however, may not be established by probabilities or possibilities." *Id.* It is respectfully submitted that the Examiner has failed to demonstrate that the inventions of claims 2-4 of the present application are "necessarily present" in Hashimoto,

which as explained above is directed to an imaging of a body part, not a microelectronic component. Therefore, the inherency rejection should be withdrawn.

Claims 1-2 were rejected under 35 U.S.C. §102(b) as being anticipated by Ishibashi et al. (US 4,980,865). This rejection is respectfully traversed. Ishibashi appears to disclose an acoustic microscope that uses a combination of C-mode and B-mode imaging to generate a 3-D image of a sample. Unlike the inventions of claims 1 and 2, Ishibashi does not disclose a data memory containing a digitized A-scan for each location interrogated at three-dimensionally varied locations in a sample. As such, Ishibashi appears to be limited to three-dimensional images of stacked planes, but does not appear to be able to pinpoint a particular point of interest or to reconstruct displays that are capable of exhibiting in-focus impedance features, out-of-focus impedance features or a combination or both. Accordingly, Ishibashi cannot anticipate claims 1 and 2.

Claims 5-6, 8-9 were rejected under 35 U.S.C. § 102(e) as being anticipated by Shokrollahi et al. (US 6,200,266). This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. As with the Hashimoto reference, Shokrollahi is directed to macro-imaging of a body part, not acoustic micro-imaging of a microelectronic sample, and the Examiner has not shown that Shokrollahi is analogous art. Further, Shokrollahi appears primarily concerned with bulk imaging of a body part and understanding the orientation of the three dimensional body part image as it is translated onto a CRT. It does not appear to address analyzing acoustic impedance features such as microscopic voids, cracks, disbonds, air bubbles or other impedance features of

an integrated circuit. Indeed, as recited in Shokrollahi at col. 6, ln. 66, it is limited to detecting abnormalities in human tissue and bones greater than 0.1 mm (which it claims is 5 times greater than conventional ultrasound imagers (see col. 7, ln. 1)). The defects in an integrated circuit are often measured in angstroms or nanometers not millimeters, and are thus many times smaller than anything that Shokrollahi is designed to identify. Furthermore, unlike the inventions of claims 5-6 and 8-9, which are directed to 4D virtual sample data memory, Shokrollahi appears to be limited to two-dimensional imaging, employing a combination of A scan acoustic impedance profiles to produce a two-dimensional, grey-scale B-scan image. Shokrollahi also nowhere discloses employing a plurality (both peak and non-peak) of acoustic reflectance signals, as recited in claims 5 and 6. As such, it is respectfully submitted that Shokrollahi cannot anticipate the inventions of claims 5-6, 8-9.

Claim 7 was rejected under 35 U.S.C. §102(b) as being anticipated by the limited translation of the abstract from Hashimoto (JP2000132664A). This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. This Hashimoto reference, like the Hashimoto(JP11009604A) addressed earlier is directed to macro-imaging of a body part, not acoustic microimaging of a microelectronic component or assembly as recited in claim 7. As such, this Hashimoto reference cannot anticipate claim 7. The limited applicability of this Hashimoto abstract is confirmed by what appears to be the U.S. counterpart patent, US 6500118, which is cited in the Office Action at page 9, as one of the prior art references made of record. *See e.g.,* Figs. 8a, 8b, 9a, 9b, 12, 13a. Furthermore, Hashimoto (JP2000132664A) does not appear to disclose a 4D virtual sample data

store containing data produced by a pulsed ultrasonic probe and representing for each point in an interrogated microelectronic sample volume three spatial dimensions and a time variable, the time variable comprising a digitized time-varying waveform including characterizations of reflections from acoustic impedance features in the examined sample, as required by claim 7. For example, Hashimoto not appear to include a digitized time-varying waveform for *each point* in an interrogated sample volume, and instead appears limited to bulk volume information provided by multiple volume scans.

Claim 7 also was rejected under 35 U.S.C. §102(b) as being anticipated by Olstad et al. (US 5,515,856). This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. Olstad is directed to a method for generating anatomical M-Mode displays in ultrasonic investigations of living biological structures such as a heart during movement employing an ultrasonic transducer. It does not appear to address acoustic micro-imaging of an integrated circuit, as explained above with respect to the other non-analogous medical imaging references relied on by the Examiner. Accordingly, Olstad cannot anticipate claim 7.

RESPONSE TO CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claims 10-17 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Olstad et al. in view of Shokrollahi. This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. As explained above, Olstad and Shokrollahi are directed to medical macro-imaging not acoustic

micro-imaging. Furthermore, Shokrollahi is directed to A and B-mode imaging abnormalities in bone structure and other human tissue, while Olstad is directed to M-Mode imaging of a moving body part, such as the heart muscle, in order to observe wall thickening of a ventricle. There is no teaching or suggestion to combine either of these references, which appear to be using disparate imaging techniques on different body parts for different purposes, as for example is discussed in the Weng reference (US 5,396,890) cited by the Examiner, which distinguishes the advantages of two-dimensional B-mode over M-mode. *See* Weng, col. 1, lns14-66; col. 2 ln.5. The Examiner has not pointed to any teaching or suggestion in either of these references that would lead one skilled in the art to use them in combination to analyze a microelectronic sample. As such, these references cannot render obvious the inventions of claims 10-17.

The Examiner also has failed to identify where Olstad or Shokrollahi disclose using both in-focus and out-of-focus reflectance data. Rather, the rejections of claims 11-13, 15-17 appear to impermissibly rely on hindsight reconstruction to support the assertion of obviousness.

Claim 18 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Olstad in view of Suzuki et al. (JP 10277042A). This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. As explained above, the Examiner has failed to show that Olstad is analogous art or that one skilled in the art would be motivated to combine Olstad with Suzuki, or that doing so would result in the invention of claim 18. As such, the combination of Olstad and Suzuki does not render obvious claim 18.

Claims 19-39 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over

Ishibashi in view of Weng (US 5,396,890). This rejection is respectfully traversed in view of the clarification that these claims are directed to acoustic microimaging of a microelectronic sample. As explained above, Ishibashi is limited to three-dimensional images of stacked planes but is not able to pinpoint a particular point of interest or to reconstruct displays that are capable of exhibiting in-focus impedance features, out-of-focus impedance features or a combination or both. Weng, is directed to a method of medical macro-imaging and does not appear to have application to acoustic micro-imaging. To the extent that Weng discloses C-mode imaging, it does not appear to show anything other than conventional C-mode imaging, which detects only the peak value of the amplitude waveform within a gate, and loses non-peak information and any associated impedance ripples. It also is respectfully submitted that *In re Karlson; In re Wilson;* and *Ex parte Rainu*, cited by the Examiner for the proposition that the "elimination of a feature and its function is not a patentably distinct invention," are inapplicable here. The recitation of "non-peak-detected" time-varying acoustic reflectance signals in claims 19-39 is not the mere *elimination* of a prior art feature. Rather, the invention of claims 19-39 uses the additional information gleaned from the non-peak values of the amplitude waveform to improve the analysis of the integrated circuit. As explained in *Karlson*, the omission of an element and its function in a combination is an obvious expedient only "if the remaining elements perform the same functions as before." Here, focus on non-peak detected signals provides additional "functionality" in the form of enhanced impedance analysis. Neither Ishibashi nor Weng utilize this non-peak detected information and therefore are not a proper basis of rejection for claims 19-39.

CONCLUSION

For the above reasons, applicants request that the rejection of claims 1-39, be reconsidered and withdrawn and that the subject application be promptly passed to issue.

Applicant hereby Petitions for an extension of time of three months to file this response pursuant to 37 CFR 1.136. A check is enclosed in the amount of $475 to cover the extension fee set forth in 37 CFR 1.17(a).

Applicant hereby authorizes the Commissioner to charge any underpayment, or credit any overpayment associated with this paper, to Deposit Account No. 23-0920. Further, should any additional petition be necessary, Applicant requests that the currently filed paper constitute any such necessary petition and authorizes the Commissioner to charge any fees associated with any such additional petition to the Deposit Account identified herein. A duplicate copy of this sheet is enclosed.

Respectfully submitted,
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